TCAS 2004

User Guide

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1 INTRODUCTION

The aim of this document is to assist eDEP users with the activities of platform installation, configuration and launching. This note contains information detailing:

- the installation of the software necessary to drive the TCAS haptic alarm;
- the set up of the TCAS resource parameters; and
- the revised file format containing the resolution advisories used by TCAS.

For more information concerning the platform design the reader should address either the Architecture Design Document (ADD) [Ref. 1] or the Detailed Design Document (DDD).

1.1 VERSION HISTORY

Release	Author	Release Date	Release Description	Modifications (sections affected and relevant information)
0.1	Graffica (Eveleigh)	10th Sept. 2003	Initial	Created.
0.2	Graffica (Eveleigh)	16th Sept. 2003	Second release.	Updated.
0.3	Graffica (Prokop)	27th Oct. 2003	Third release.	Updated.
0.4	Graffica (Prokop)	3rd Nov. 2003	Fourth release.	Updated following simulation.
0.5	Graffica (Aynsworth)	17th March 2004	Fifth release.	Updated for 2004 simulations.
0.6	Graffica (Aynsworth)	21st June 2004	Sixth release.	Added description of TCAS server resources.

1.2 REFERENCES

The following documents are referenced.

1. eDEP Architecture Design Doc., GL/eDEP/ADD/1 V1.8, M. Vere, March 2003
2. eDEP GSDK Detailed Design, 1.5, M.Vere, October 2002
3. eDEP ATC Detailed Design, GL/eDEP/DDD/1/1.9, M. Vere, March 2003
4. eDEP User Guide, Graffica, May 2004.
5. eDEP ATCX User Guide, Graffica, May 2004.

1.3 ABBREVIATIONS

Abbreviation	Meaning
CWP	Controller Working Position
IDE	Integrated Development Environment
JRE	Java Runtime Environment
JVM	Java Virtual Machine
SDK	Software Development Kit

2 INSTALLATION NOTES

2.1 HAPTIC ALARM

To install the driver necessary to control the haptic alarm through a parallel port follow the installation instructions at www.geocities.com/juanga69/parport.

This will involve copying parport.dll to your <JDK>\bin i.e. the bin folder below your JDK installation.

If you have Windows NT (or higher) then you will also need to install UserPort. You will need administrator privileges to use UserPort as it grants you access to hardware addresses that are not usually available to a user.

Step by step instructions for the installation of parport and UserPort can be obtained from www.geocities.com/juanga69/parport.

If the parport.dll file is not copied to the correct location, a Java UnsatisifiedLinkError will be generated. If the UserPort software is not used to provide access to the parallel port addresses, an exception will be raised when eDEP attempts to control the port. Typical output when this exception is raised is shown below.

```
An unexpected exception has been detected in native code outside the VM.
Unexpected Signal : EXCEPTION_PRIV_INSTRUCTION occurred at PC=0xD30107B
Function=[Unknown.]
Library=C:\j2sdk1.4.0_01\bin\parport.dll
NOTE: We are unable to locate the function name symbol for the error
      just occurred. Please refer to release documentation for possible
      reason and solutions.
Current Java thread:
        at parport.ParallelPort.writeOneByte(Native Method)
        at parport.ParallelPort.write(ParallelPort.java:60)
        at test.parallel.SimpleHapticTest.sendHexPair(SimpleHapticTest.java:45)
        at
test.parallel.SimpleHapticTest$ButtonListener.actionPerformed(SimpleHapticTest.java:84)
        at java.awt.Button.processActionEvent(Button.java:381)
        at java.awt.Button.processEvent(Button.java:350)
        at java.awt.Component.dispatchEventImpl(Component.java:3526)
        at java.awt.Component.dispatchEvent(Component.java:3367)
        at java.awt.EventQueue.dispatchEvent(EventQueue.java:445)
        at java.awt.EventDispatchThread.pumpOneEventForHierarchy(EventDispatchThread.java:191)
        at java.awt.EventDispatchThread.pumpEventsForHierarchy(EventDispatchThread.java:144)
        at java.awt.EventDispatchThread.pumpEvents(EventDispatchThread.java:138)
        at java.awt.EventDispatchThread.pumpEvents(EventDispatchThread.java:130)
        at java.awt.EventDispatchThread.run(EventDispatchThread.java:98)

Dynamic libraries:
0x00400000 - 0x00406000       C:\j2sdk1.4.0_01\bin\javaw.exe
0x77F80000 - 0x77FFB000       C:\WINNT\System32\ntdll.dll
0x0E800000 - 0x0E80B000       C:\WINNT\System32\PSAPI.DLL

Local Time = Tue Sep 09 17:40:44 2003
Elapsed Time = 4
#
# The exception above was detected in native code outside the VM
#
# Java VM: Java HotSpot(TM) Client VM (1.4.0_01-b03 mixed mode)
#
```

2.2 SUPPORT FOR MP3 FILES

If MP3 Support is required, the Java SPI is required. This library is platform independent. The Java SPI Framework is available for download from:

http://www.javazoom.net/mp3spi/mp3spi.html

Copy tritonus_share.jar, mp3spi1.9.jar and jl0.4.jar into the TOOLS directory and add a reference to each in eclipse in Project – Properties – Java Build Path – Libraries.

3 RESOURCE DESCRIPTIONS

RESOURCE	TYPICAL VALUE	DESCRIPTION
IFPL.SCENARIO	"tcas/resources/scenarios/54/CORA1_54_TRAFFIC.dat"	The traffic file used in the scenario. This resource is set automatically in the launcher.
IAS.SCENARIO_READER	"tcas.ias.server.TCASScenarioReaderImpl"	The Scenario Reader class implementation defined for TCAS.
TCAS.ABBREVIATE_CLEAR	"COC"	TCAS default abbreviations/symbols. Note: can use Unicode to define symbols e.g. replace "CLM" with "\\u2191" to get up arrow. Similarly, replace "ICL" with \\u2191\\u2191 to get a double up arrow.
TCAS.ABBREVIATE_CLIMB	"CLM"	
TCAS.ABBREVIATE_CLIMB_CLIMB	"ICL"	
TCAS.ABBREVIATE_DESCEND	"DES"	
TCAS.ABBREVIATE_DESCEND_DESCEND	"IDE"	
TCAS.ABBREVIATE_CLIMB_500FPM	"LC5"	
TCAS.ABBREVIATE_CLIMB_1000FPM	"LC1"	
TCAS.ABBREVIATE_CLIMB_2000FPM	"LC2"	
TCAS.ABBREVIATE_DESCEND_500FPM	"LD5"	
TCAS.ABBREVIATE_DESCEND_1000FPM	"LD1"	
TCAS.ABBREVIATE_DESCEND_2000FPM	"LD2"	
TCAS.RESOLUTION_FLASH_RATE_MS	1000.0	Duration, which TCAS label and/or background will remain on when flashing.
TCAS.RESOLUTION_FLASH_OFF_RATE_MS	1000.0	Duration, which TCAS label and/or background will remain off when flashing.
VVC.AUDIO_ALARM.CLASS	"tcas.vvc.server.AudioAlarmImpl"	The Audio alarm class implementation defined for TCAS.
VVC.STCA_WARNING	ON	Can be either ON or OFF. When ON STCA "softly spoken" warning will be issued.
VVC.STCA_STERN_WARNING	ON	Can be either ON or OFF. When ON STCA

RESOURCE	TYPICAL VALUE	DESCRIPTION
		"sternly spoken" (2nd) warning will be issued.
VVC.HAPTIC_ALARM.CLASS	"tcas.vvc.server.HapticAlarmImpl"	The Haptic alarm class implementation defined for TCAS.
VVC.PARALLEL_PORT_ADDRESS	888	Parallel port address (decimal) of haptic alarm (888 = 0x378).
VVC.HAPTIC_ALARM_SIGNAL_ON	128	Byte value (decimal) to switch alarm on (128 = 0x80).
VVC.HAPTIC_ALARM_SIGNAL_OF	0	Byte value (decimal) to switch alarm off.
VVC.RESOLUTION_TCAS_AUDIO_PERIOD_MS	5000.0	Time (ms) at which TCAS audio alarm will be repeated.
VVC.RESOLUTION_VIBRATE_DURATION_MS	10000.0	Duration (ms) which haptic alarm will vibrate for.
VVC.SCENARIO	"tcas/resources/scenarios/54/54_sounds.dat	The location of the sound clips file. This resource is set automatically in the launcher. The name is derived from the scenario name.
VVC.SOUNDFILE_DIRECTORY	"tcas/resources/sounds/"	The location of the sound clips played when an STCA or TCAS alert occurs.
VVC.CONFLICT_CLIP	conflict.wav	1st STCA clip to be played. The filename is specified relative to the sound file directory specified above.
VVC.CONFLICT_CONFLICT_CLIP	conflictconflict.wav	2nd STCA clip to be played. The filename is specified relative to the sound file directory specified above.

RESOURCE	TYPICAL VALUE	DESCRIPTION
VVC.TCAS_TCAS_CLIP	tcastcas.wav	TCAS alert to be played. The filename is specified relative to the sound file directory specified above.

The TCAS Launcher uses the resources defined below to realize the four different HMI variants.

TCAS.RESOLUTION_TEXT	<string>	The text to be displayed in the aircraft label, typically TCAS or RA.
TCAS.RESOLUTION_DIRECTION	<boolean>	Determines whether the resolution sense is displayed.
TCAS.RESOLUTION_FLASH_TEXT	<boolean>	Determines whether flashing text is displayed.
TCAS.RESOLUTION_AC_INVOLVED	<boolean>	
TCAS.RESOLUTION_BACKGROUND	<”OFF” | “HIGHLIGHT” | “FLASH”>	
VVC.RESOLUTION_AUDIO	<"OFF" | “SINGLE” | “CONTINUOUS”>	Determines whether the TCAS warning is played and if it is played, whether it is played once or continuously.
VVC.RESOLUTION_VIBRATE	<"OFF" | “SINGLE” | “CONTINUOUS”>	Determines whether the haptic alarm is triggered and if it is triggered, whether it is triggered once or continuously.
TCAS.RESOLUTION_HIGHLIGHT_AC_INVOLVED	<boolean>	Determines whether an aircraft, involved in an advisory, without an advisory is highlighted.

The settings for each of the four HMI variants are listed below. Changing these settings will enable the user to change the configuration of one of the predefined HMIs.

TCAS.HMIMIN_RES_TEXT	"TCAS"	TCAS HMI Minimum configuration
TCAS.HMIMIN_RES_DIRECTION	FALSE	
TCAS.HMIMIN_RES_FLASH_TEXT	FALSE	
TCAS.HMIMIN_RES_AC_INVOLVED	FALSE	
TCAS.HMIMIN_RES_BACKGROUND	HIGHLIGHT	
TCAS.HMIMIN_RES_AUDIO	"OFF"	

RESOURCE	TYPICAL VALUE	DESCRIPTION
TCAS.HMIMIN_RES_VIBRATE	"OFF"	
TCAS.HMIMIN_RES_HIGHLIGHT_AC_INVOLVED	TRUE	
TCAS.HMIINT_RES_TEXT	"TCAS"	TCAS HMI Intermediate configuration
TCAS.HMIINT_RES_DIRECTION	TRUE	
TCAS.HMIINT_RES_FLASH_TEXT	FALSE	
TCAS.HMIINT_RES_AC_INVOLVED	FALSE	
TCAS.HMIINT_RES_BACKGROUND	HIGHLIGHT	
TCAS.HMIINT_RES_AUDIO	"OFF"	
TCAS.HMIINT_RES_VIBRATE	"OFF"	
TCAS.HMIINT_RES_HIGHLIGHT_AC_INVOLVED	TRUE	
TCAS.HMIEXT_RES_TEXT	"TCAS"	TCAS HMI Extreme configuration
TCAS.HMIEXT_RES_DIRECTION	TRUE	
TCAS.HMIEXT_RES_FLASH_TEXT	FALSE	
TCAS.HMIEXT_RES_AC_INVOLVED	FALSE	
TCAS.HMIEXT_RES_BACKGROUND	FLASH	
TCAS.HMIEXT_RES_AUDIO	"SINGLE"	
TCAS.HMIEXT_RES_VIBRATE	"SINGLE"	
TCAS.HMIEXT_RES_HIGHLIGHT_AC_INVOLVED	TRUE	
CLOCK.STOPTIME	"16:43:00"	This determines the end time of the simulation. When set, the entire application shuts down at the specified time.
ACSG.ACS_HOSTNAME	The hostname of the ACAS Server	
ACSG.ACS_PORT	The port on which to connect to the ACAS Server	
ACSG.LOCAL_PORT	The port on the local machine to which to listen	

4 REVISED RESOLUTION ADVISORY FILE FORMAT

TCAS_Advisory = <time> + <callsign> + <altitude> + [<advisory> + [<involved_aircraft>]];

Where time = nn:nn:nn

callsign = name

altitude = number

involved_aircraft = name

advisory = < "CLEAR" | <descend_advisory> | <climb_advisory> >

descend_advisory = string starting with the text "DESCEND"

climb_advisory = string starting with the text "CLIMB"

4.1 EXAMPLES

Time	Callsign	Altitude	Advisory	Involved Aircraft
16:13:26	CNF001	31550	DESCEND	SPOOF
16:13:27	CNF001	31550	DESCEND_DESCEND	SPOOF
16:13:28	CNF001	31550	DESCEND_500FPM	SPOOF
16:13:29	CNF001	31550	DESCEND_1000FPM	SPOOF
16:13:29	CNF001	31550	DESCEND_QUICKLY	SPOOF

The advisories CLEAR, CLIMB and DESCEND have default abbreviations COC, CLM and DES but can be replaced by the user by defining abbreviations in the TCAS resource file. For any other advisory to be indicated on the display a matching abbreviation must exist in the TCAS resource file e.g. TCAS.ABBREVIATE_DESCEND_QUICKLY "DQ"

Note: For backwards compatibility the previous advisories "DESCEND DESCEND" and "CLIMB CLIMB" can still be used but internally they will be treated as "DESCEND_DESCEND" and "CLIMB_CLIMB" respectively.

5 SCENARIOS

The CORA2 2002 traffic files have been added to the tcas scenarios. A distributed scenario has been created, this is TCASTest4. This scenario cannot be launched through the launcher. Bat files have been provided to launch this scenario. The common_distribution.gsdk file will need to be modified, to include the appropriate discovery host name.

The original scenario files are compatible with the new file format.

6 THE LAUNCHER

The Launcher allows a TCAS scenario to be launched in a number of different distribution modes. The modes are

1. Standalone, where the scenario is run on a single machine
2. CWP Only, runs the CWP without the VVC
3. VVC Only, is run on a remote machine to pair with a CWP.

Note: When running CWP Only on one machine and VVC Only on a remote machine care should be taken to make sure the same scenario is chosen and the HMI variants chosen correspond to what is desired. Note: configuring sound options on the CWP Only machine will have no effect on the VVC and vice versa.

The TCAS launcher provides a number of differing HMI variants. The launcher, showing the available HMI variants, is shown in Figure 1, below.

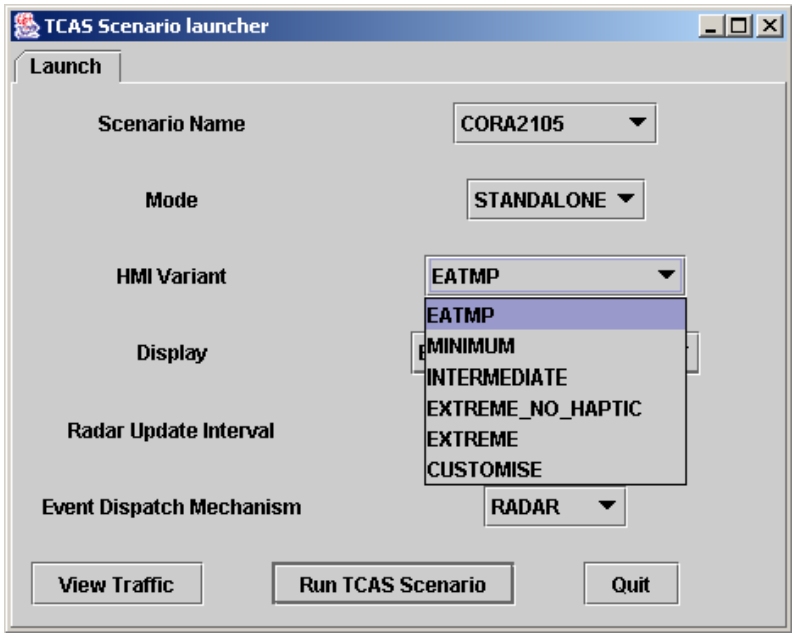

Figure 1 Launcher Showing HMI Variants

It can be seen from Figure 1 that the launcher supports a customise HMI mode This allows a user to create a bespoke HMI. If the user selects the customise HMI variant, a second tabbed pane, named RAOptions, is included in the launcher. This is shown in figure 2, below.

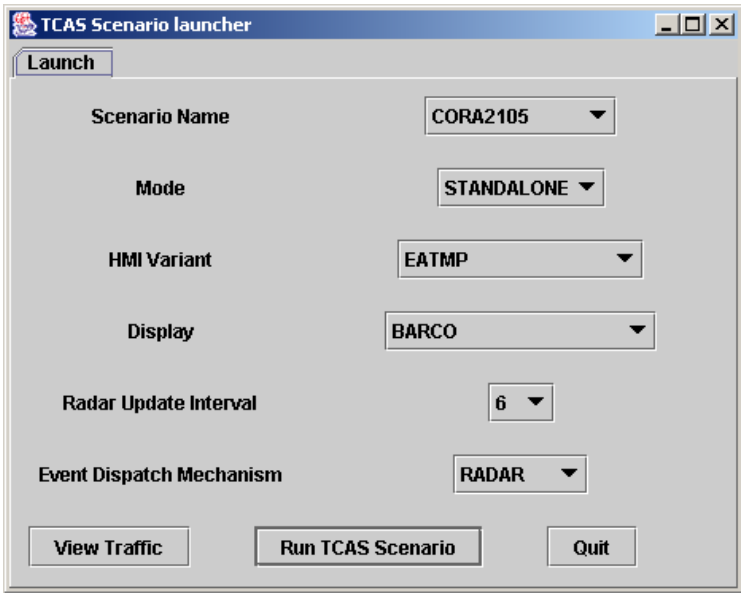

Figure 2 Launcher with RAOptions Tab

Figure 3, below, illustrates the options that can be customised through the launcher.

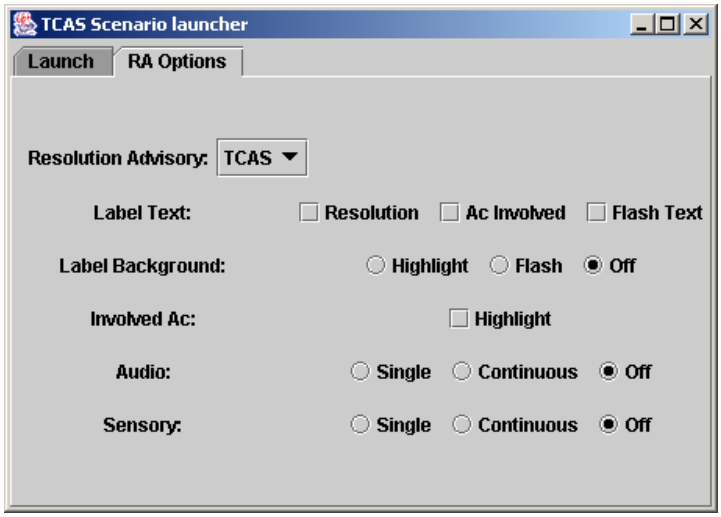

Figure 3 Defining a Customised HMI

Customised HMIs cannot be saved. However, the contents of the standard HMIs can be changed through the resource parameters.

7 SOUND CLIPS FILE

An example scenario sound clips file is shown above. When adding sound clips, the following rules shall be followed:

```
//time filename
//
16:12:10  "AF855PT leaves_with acnoise.wav"
16:12:11  "AF855PT leaves_with acnoise.wav"
16:19:10  "AF936EZ Leave_with_hum+noise.mp3"
16:19:30  "AF936EZ Leave_with hum+noise.wav"
```

The sound clips, i.e. the .wav or mp3 files, shall reside in a directory, sounds, located in the scenario directory. For example, given the scenario TCASTest1, the sound clips are located in TCASTest1/sounds.

The file name of the scenario sound clips file shall be <<scenario_name>>_sounds.dat, e.g. for the test scenario TCASTest1, the scenario sound clips file is TCASTest1_sounds.dat. This file shall be located in the scenario directory; in the example TCASTest1.

The resource VVC.SCENARIO specifies the location of the sound clips file. This resource is set automatically in the launcher. It is not necessary to set this resource in the scenario's resource file. The location is derived from the scenario name. Given the scenario TCASTest1, located in the directory TCASTest1, the resource would be set to:

"tcas/resources/scenarios/TCASTest1/TCASTest1_sounds.dat"

If the Java SPI is installed as described in the installation notes, MP3 files can be used in addition to WAV files. The type of file is determined by the file extension.

8 LAUNCHING THE AIR CONFIGURATION

The air configuration is automatically launched if the resource parameter IAS.TRAJECTORY_TO_FLY is set to AIRCRAFT in the tcas_cwp.gsdk file. In addition to specifying flown trajectory, it is also necessary to list the Pilot Working Positions to be included in the scenario. This is achieved by setting the PWP.NAMES resource parameter. The PWPs are assigned to sectors in the tcas_pwp.gsdk file, an extract of this file is shown in the figure below.

```
@LOAD "atcapp/resources/common/pwp_defaults.gsdk"

PWP1.FREQUENCY ( 124.3, 126.7, 133.35, 135.45 )
PWP2.FREQUENCY (120.185, 122.725, 119.25, 120.15, 119.15 )

PWP1.WIDTH          900
PWP1.HEIGHT         800
PWP1.PVD.WIDTH      300
PWP1.PVD.HEIGHT     300
PWP1.PVD.LATITUDE  50.0
PWP1.PVD.LONGITUDE  3.0
PWP1.PVD.SCALE      200
```

An option to launch the air configuration is not included in the Launcher because it was thought that this would be an option that would not change on a regular basis, and it could even lead to some confusion.

9 CHANGING TCAS ALERT COLOURS

The colours of the TCAS alert buttons are configured, and hence may be changed, through the TCAS logical colour file. This file is located in tcas/resources. The contents of this file are illustrated below. The physical colours referenced in this file, in the example below, Orange and Green, must be included in the eDEP physical colours file. This file is located in atcapp/resources/common/graphics.

```
TCAS.LOGICAL_COLOURS
(
   ( ALERT_DEFAULT_BACKGROUND, Orange ),
   ( ALERT_DEFAULT_FOREGROUND, Green )
)
```

10 STOPPING SCENARIOS AT A SPECIFIED TIME

There are two mechanisms for stopping a scenario: specifying the CLOCK.STOPTIME resource parameter or using the scripted event tool. The resource parameter mechanism is detailed in the eDEP User Guide [Ref. 5] whilst the scripted event mechanism is described in the eDEP ATC Extensions User Guide [Ref. 5].

11 USING THE ILS CAPABILITY

If the ILS landing functionality is to be utilised, the ils_defaults.gsdk resource file must be loaded. It is imperative that a STAR's constituent points correctly align the aircraft with the runway; otherwise the aircraft will not be captured by the ILS. There is a thirty degree capture angle in which the approach the runway.

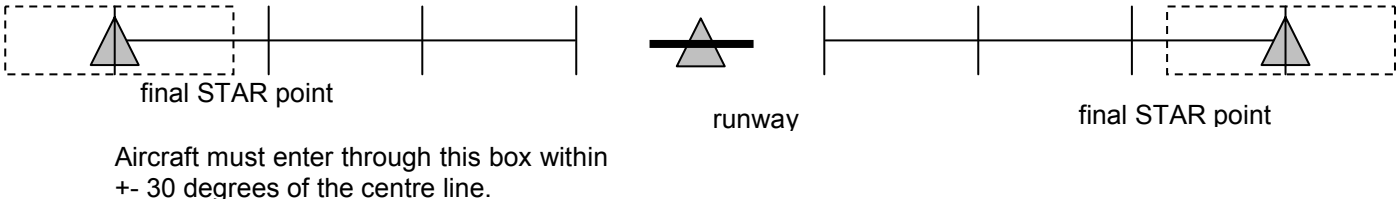

Figure 4 ILS Capability